Task 1:

Stuffing Envelopes

iM Illustrative Mathematics
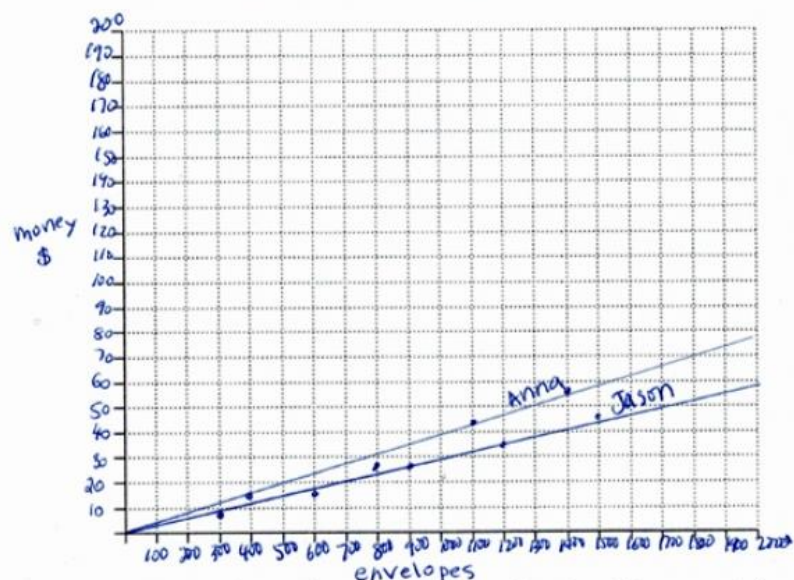
Task

Anna and Jason have summer jobs stuffing envelopes for two different companies. Anna earns $14 for every 400 envelopes she finishes. Jason earns $9 for every 300 envelopes he finishes.

a. Draw graphs and write equations that show the earnings, y as functions of the number of envelopes stuffed, n for Anna and Jason.


b. Who makes more from stuffing the same number of envelopes? How can you tell this from the graph?

Anna makes more because her line is above Jason's

$14 \div 400 = .035$

$9 \div 300 = .03$

c. Suppose Anna has savings of $100 at the beginning of the summer and she saves all her earnings from her job. Graph her savings as a function of the number of envelopes she stuffed, n. How does this graph compare to her previous earnings graph? What is the meaning of the slope in each case?
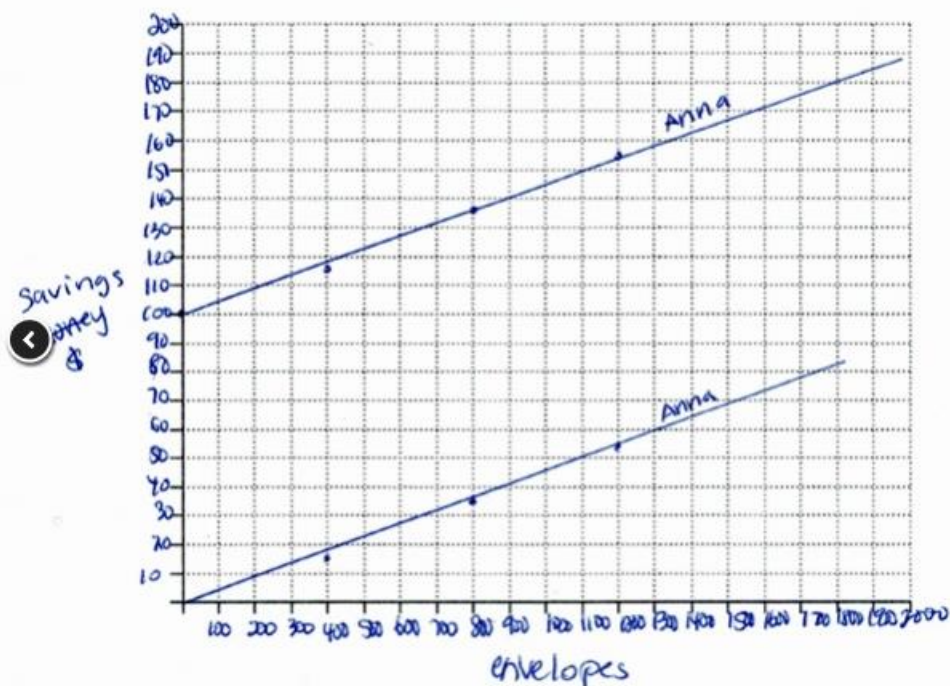
The graph is higher up but its paralell because she earned the same amount just had more $ to start with.   The slope is .035 and it means you go up 0.35 and over
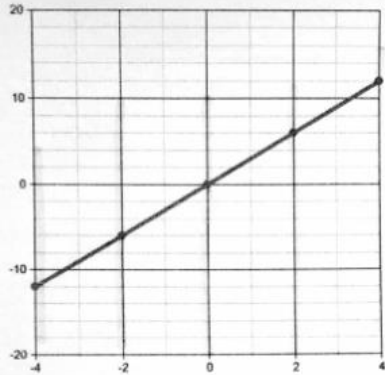
Task 2:

Name _____

Examine the graphs below. Which, if any, could represent the graph of a function? Explain why or why not for each graph. Use the vertical line test.
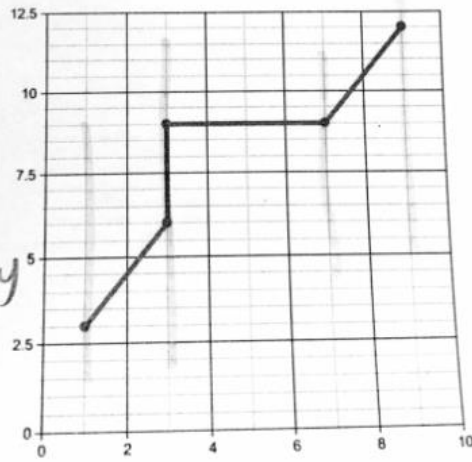
1.

yes It Is
a function
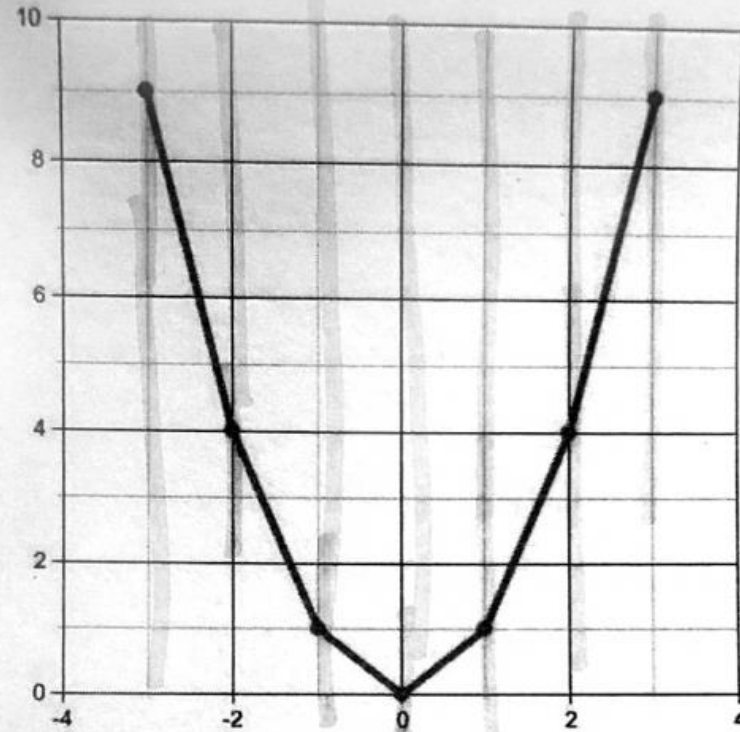because every
input has
exactly one
output

2.

no because
It does
not pass
the vertical
line test

because every
input does
not have
exactly
ine output

3.

yes It is a function
every input has exactly
one output

Please note that inclusion of these sample tasks does not represent that this task is endorsed by or rejected by the Kentucky Department of Education. Inclusion of these tasks was for the sole purpose of allowing participants the opportunity to investigate the content standards within the *Kentucky Academic Standards for Mathematics* more closely. All tasks were selected from https://tntp.org/student-work-library.

Task 3:

1. What is the slope of the line that passes through points A and B?

   A. 2
   B. -2
   C. 4
   D. -4

   $$\frac{\Delta y}{\Delta x} \quad \frac{-4}{+2} = -2$$

2. What is the slope of the line that connects points C and D?

   A. -1
   B. 0
   C. 1
   D. Undefined

   $$\frac{\Delta y}{\Delta x} = \frac{0}{+4} = 0$$

3. What is the slope of the graph of this linear function?

x	y
-4	3
-1	2
2	1
5	0

   +3 ⟨ ⟩ -1

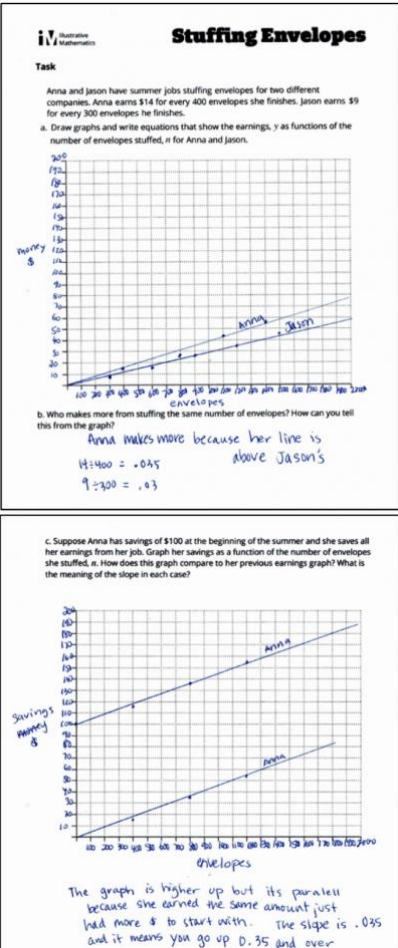 $$\frac{\Delta y}{\Delta x} \quad \frac{-1}{+3} = -\frac{1}{3}$$

4. What is the slope the line that passes through (2,3) and (4,7)?

   $$+2 \left(\begin{array}{c|c} x & y \\ \hline 2 & 3 \\ 4 & 7 \end{array} \right) +4 \qquad \frac{+4}{+2} = \frac{2}{1}$$

Participant Guide

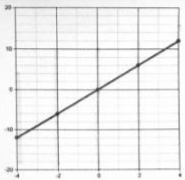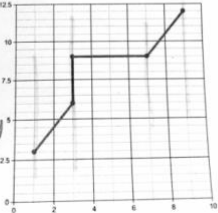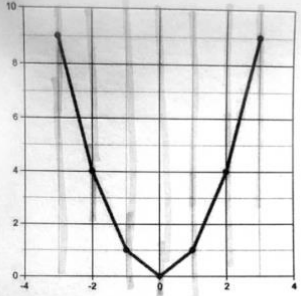| Student Work Sample	Standard of Mathematical Content Focus	Degree of Alignment	Standards of Mathematical Practice (SMP) Focus
Sample Task 1: 	Can you identify the targeted content standard(s) for this task?	• None/Weak • Partial • Strong	Can you identify the targeted practice standard(s) for this task?

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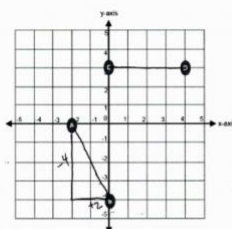
Student Work Sample	Standard of Mathematical Content Focus	Degree of Alignment	Standards of Mathematical Practice (SMP) Focus
Sample Task 2: Name_____ Examine the graphs below. Which, if any, could represent the graph of a function? Explain why or why not for each graph. Use the vertical line test. 1. yes it is a function because every input has exactly one output 2. no because it does not pass the vertical line test because every input does not have exactly one output 3. yes it is a function every input has exactly one output	Can you identify the targeted content standard(s) for this task?	• None/Weak • Partial • Strong	Can you identify the targeted practice standard(s) for this task?

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Student Work Sample	Standard of Mathematical Content Focus	Degree of Alignment	Standards of Mathematical Practice (SMP) Focus
Sample Task 3: 1. What is the slope of the line that passes through points A and B? A. 2 B. -2 C. 4 D. -4 $\frac{\Delta y}{\Delta x}$ $\frac{-4}{+2} = -2$ 2. What is the slope of the line that connects points C and D? A. -1 B. 0 C. 1 D. Undefined $\frac{\Delta y}{\Delta x} = \frac{0}{+4} = 0$ 3. What is the slope of the graph of this linear function? $\frac{\Delta y}{\Delta x}$ $\frac{-1}{+3} = -\frac{1}{3}$ 4. What is the slope the line that passes through (2,3) and (4,7)? $\frac{+4}{+2} = \frac{2}{1}$	Can you identify the targeted content standard(s) for this task?	• None/Weak • Partial • Strong	Can you identify the targeted practice standard(s) for this task?

Facilitator's Guide

Throughout facilitation of this activity it will be important to remind participants:
- Use the grade-level overview to determine the relevant cluster(s) to look at more closely
- Questions regarding Standards for Mathematical Practices will only be indicated where specific practices were identified within the source of the task alignment. Additionally, emphasize to participants the statement at the end of each cluster within the *KAS for Mathematics*, "The identified mathematical practices, coherence connections, and clarifications are possible suggestions; however, they are not the only pathways."

Sample Task 1:
This assignment is strongly aligned to the standards.

OVERVIEW
Eighth-grade students draw graphs and write equations to represent a real-world scenario about earning money by stuffing envelopes, and then interpret the meaning of the rate associated with each graph/equation. The assignment is strongly aligned to eighth-grade standards because it involves graphing proportional relationships and finding and interpreting the unit rate of these graphs.

RELATED STANDARDS
We looked at how well the assignment aligned to the following standards:

KY.8.EE.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.'
KY.8.F.4 Construct a function to model a linear relationship between two quantities.
    a. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph.
    b. Interpret the rate of change and initial value of a linear function in terms of the situation it models and in terms of its graph or a table of values.

WHY IS THIS ASSIGNMENT STRONGLY ALIGNED?
Students explore proportional relationships through tables, equations, and graphs in seventh grade (standard KY.7.RP.2), and extend the concepts of proportional relationships to linear equations in eighth grade. Because the assignment asks students to interpret the unit rates/rates of change of two graphs in the context of the situation being modeled, it connects and extends their understanding from seventh grade in a manner appropriate to eighth grade.

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Standards KY.8.EE.5 and KY.8.F.4 target conceptual understanding, procedural skill, and application, and the assignment addresses each of those. Students build conceptual understanding when they determine which envelope-stuffing rate is greater, use procedural skill by graphing the two relationships, and apply mathematics to a real-world scenario.

Practice Standards

The assignment provides an opportunity for students to engage with Mathematical Practice Standard #2 ("Reason abstractly and quantitatively"). For instance, they decontextualize the math—that is, they think about the numbers and math separate from the real-world context—to construct a graph for each situation, then recontextualize—or consider the meaning of the numbers and the math in terms of the real-world context—as they use the graph and rate to determine who earns more for stuffing envelopes.

Sample Task 2:

This assignment is partially aligned to the standards.

OVERVIEW

Eighth-grade students look at relationships to determine whether they represent a function. The assignment is partially aligned to an eighth-grade standard because it addresses the concept of a function, but it doesn't ask students to reason about whether or not a graph represents a function, nor does it focus on identifying functions in other forms.

RELATED STANDARDS

We looked at how well the assignment aligned to the following standard:

KY.8.F.1 Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.

WHY IS THIS ASSIGNMENT PARTIALLY ALIGNED?

The assignment is aligned to the content of standard KY.8.F.1 because it contains graphical representations and asks students to determine whether they are functions. Two examples represent functions and one example does not, so students can note the difference between the two.

Standard KY.8.F.1 requires students to understand the concept of a function. For example, students might make connections between the visual image and the definition of a function, and reason about how and where the inputs and outputs appear on the graph. However, in this assignment students are instructed to use the vertical line test to determine whether provided graphs represent functions, a shortcut that leads to the right answer without requiring conceptual understanding of what assigning exactly one output to each input actually means. In standard KY.8.F.2 students are comparing properties of two functions represented in different ways, including algebraically, graphically, numerically in tables, or by verbal descriptions. Students need to develop a conceptual understanding of what a function is holistically, not only focused on graphing or on the vertical line test.

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Sample Task 3:

This assignment is weakly aligned to the standards.

OVERVIEW

Eighth-grade students find the slope of the line through two given points in a variety of formats. The assignment is weakly aligned to the eighth-grade standard because it does not require students to make connections between their understandings of similar triangles and slope of linear equations.

RELATED STANDARDS

We looked at how well the assignment aligned to the following standard:

KY.8.EE.6 Use similar triangles to explain why the slope, m, is the same between any two distinct points on a non-vertical line in the coordinate plane; know the equation y = mx for a line through the origin and the equation y = mx + b for a line intercepting the vertical axis at b.

WHY IS THIS ASSIGNMENT WEAKLY ALIGNED?

The assignment misses the opportunity for students to make connections between their conceptual understanding of similar triangles and the slope of a linear equation, as required by standard KY.8.EE.6. When this connection is made explicit, it gives students a deeper understanding of what the slope of a line means and provides an authentic application of the concept of triangle similarity.

Standard KY.8.EE.6 calls for students to explain why the slope m is the same between any two distinct points on a non-vertical line, which requires students to have a conceptual understanding of what slope is. The assignment only tests for procedural skill by asking students to simply calculate the value of the slope.

Practice Standards

The assignment does not support students' use of any mathematical practice standards, even though standard KY.8.EE.6 presents an opportunity for students to engage with Mathematical Practice Standard #8 ("Look for and express regularity in repeated reasoning"). By constructing a right triangle that connects two distinct points on a non-vertical line in the coordinate plane, students can visualize the slope of the line as represented by the hypotenuse of a right triangle. Then, by selecting any other two points on the same non-vertical line and constructing the corresponding right triangle, students can recognize that the two triangles are similar and therefore have a basis for understanding slope as a constant rate of change.